

Hanford Tank Farms Vadose Zone Monitoring Project Quarterly Summary Report for 3rd Quarter FY 2002

Introduction

Routine quarterly reports for the Hanford Tank Farms Vadose Zone Monitoring Project (VZMP) are issued to summarize the results of monitoring activities, provide the status of any on-going special investigations, and provide an updated listing of borehole intervals where monitoring is planned in the coming months.

VZMP Monitoring Results

A summary of monitoring operations from April 1 to June 30, 2002 is included in Table 1.

Table 1. Summary of Monitoring Operations

Month	April	May	June	FY Cumulative Total
Total Boreholes	34	47	32	241
Main Log Footage	1778.5	2348.5	1356.5	13091.5
Rerun Log Footage	94	110	70	664
Total Footage	1872.5	2458.5	1426.5	13,755.5

Attachment 1 is a table that provides further details of boreholes monitored during the 3rd quarter of FY 2002, including borehole number, tank number, logging depths and footage, total score (logging priority), projected next monitoring date, dates of High Rate Logging System (HRLS) logging events, dates of RAS monitoring events, and a comment section. This table is derived from the database "Prioritized Listing of Borehole Monitoring Intervals" included in the baseline monitoring plan issued June 2001 (DOE 2001). The database is continually updated as boreholes are monitored. The most important change that occurs in the database is the monitoring frequency. Where monitoring results suggest possible contaminant movement, the monitoring frequency may be changed.

Since March 2002, evidence of possible contaminant movement has been identified in four additional boreholes: 30-06-10 in C Farm, 52-03-06 and 52-06-05 in TY Farm, and 51-03-11 in TX Farm. The attached plots (Attachment 2) show a comparison of the current RAS and the Spectral Gamma Logging System (SGLS) baseline measurements for these boreholes and indicate the depth intervals of suspected contaminant movement. The dominant contaminants detected in these boreholes are cobalt-60 (⁶⁰Co) and cesium-137 (¹³⁷Cs).

Data collected from borehole 30-06-10 continued to exhibit evidence of downward migration of ⁶⁰Co below approximately 125 ft. This movement was previously noted in a letter to DOE dated March 10, 1999 (MACTEC-ERS 1999).

Data collected from borehole 52-03-06 showed a definite increase in ¹³⁷Cs just below the excavation for tank TY-103 when compared to the SGLS baseline. According to protocol established in the VZMP work plan (DOE 2001), verbal notification was made to CH2MHILL Hanford Group (CHG) tank operations.

This notification resulted in the initiation of Occurrence Report PER 2002-2444. Additional measurements were collected with the SGLS to confirm the finding. A preliminary letter report was provided to the Department of Energy Office of River Protection (DOE-ORP) on May 13, 2002 (MACTEC-ERS 2002) to document the measurements and provide recommendations for future monitoring. The recommended monitoring schedule for this borehole is quarterly, such that the next measurement will be in August 2002. Log results for borehole 52-03-06 are discussed in more detail in Attachment 3, "Evidence of Potential Contaminant Movement in Borehole 52-03-06."

The RAS log of borehole 52-06-05 suggests that ^{60}Co concentrations may be increasing between 130 and 147 ft in depth. The RAS log of borehole 51-03-11 suggests that ^{60}Co concentrations may be increasing at 62 ft and between 90 and 95 ft.

Boreholes 30-06-10, 52-03-06, and 52-06-05 were originally selected for a biannual monitoring frequency. Boreholes 30-06-10 and 52-06-05 will remain on the biannual monitoring frequency, and it is proposed that borehole 52-03-06 be monitored on a quarterly basis. The monitoring frequency for borehole 51-03-11, originally scheduled for annual monitoring, will be changed to biannual.

Neutron moisture logging in borehole 52-03-06 and other boreholes is recommended to determine if the observed contaminant movement may be associated with increases in vadose zone moisture content.

In the interest of brevity, plots for boreholes where no apparent change was observed will not be included in this report. These logs are available on request.

Special Investigations

A special investigation of boreholes around tank U-107 (U Farm) continues. This investigation was initiated in June 2001 at the request of the DOE-ORP Project Manager to support waste retrieval operations. The fourth quarterly monitoring event for selected boreholes was initiated on April 10, 2002 and completed on April 17, 2002. No significant changes in contaminant profile have been observed in three monitoring events conducted since June 2001. It is likely that the elapsed time between monitoring events is not sufficient to detect subtle changes in contaminant profile resulting from slow movement of contaminants in the vadose zone. It is recommended these boreholes continue to be monitored on a quarterly basis until the waste retrieval operations are completed. The next scheduled monitoring event in U Farm is July 2002.

A special request was made verbally from CHG personnel to monitor boreholes in the proximity of tank S-112 at S Tank Farm, in advance of planned retrieval operations. RAS data were collected in six boreholes during June to provide a baseline against which future measurements collected during waste retrieval operations can be compared. When compared to baseline SGLS data, the RAS data showed no apparent changes. The six boreholes will be tentatively placed on a monitoring frequency of 6 months (biannual) until retrieval project monitoring requirements are defined.

Since the monitoring project started in June 2001, one or more regions of high gamma flux that are beyond the range of the RAS detection system have been identified in 25 tank farm boreholes. The high rate logging system (HRLS) is required in these boreholes to assess potential changes. During the third quarter, 14 of these boreholes had been logged. High rate logging activities will continue for the remaining 11 boreholes depending on the availability of the HRLS and logistical support. Table 2 provides a summary of the HRLS logging during the third quarter that includes the borehole, date of logging, the footage collected with each shielding configuration, date of the last RAS logging event, and an assessment of the data results when comparisons with HRLS logging conducted in 1999 were made.

Table 2. Summary of High Rate Logging

Borehole	Date of Logging	NS ¹ (ft)	ES ² (ft)	IS ³ (ft)	Both ⁴ (ft)	Repeat (ft)	Date of RAS Log	Comment
21-02-04	06/27/02	151.0	0	65.0	0	0	09/04/01	No apparent change
21-07-06	05/20/02	0	12.0	0	0	0	09/05/01	No apparent change
21-10-03	05/21/02	18.0	0	17.0	0	0	08/30/01	No apparent change
40-02-03	04/25/02	0	10.0	0	0	0	None	No apparent change
40-04-05	04/24/02	10.0	0	5.0	0	0	06/11/02	No apparent change
41-07-05	04/19/02	0	0	0	6.0	0	09/25/01	No apparent change
41-07-07	04/19/02	0	0	0	11.0	0	04/09/02	No apparent change
41-08-07	04/18/02	0	0	0	9.5	0	09/25/01	No apparent change
41-08-11	04/19/02	0	0	0	13.0	0	09/26/01	No apparent change
41-09-03	04/22/02	0	0	11.0	0	0	09/26/01	No apparent change
41-09-07	04/22/02	0	0	9.0	0	0	04/05/02	No apparent change
41-11-10	04/18/02	8.0	00	0	0	0	04/09/02	No apparent change
41-12-02	04/23/02	25.0	16.0	4.0	0	0	10/03/01	No apparent change
52-03-03	05/13/02	0	0	5.5	0	5.5	05/14/02	No apparent change
Totals		212.0	38.0	116.5	39.5	5.5		411.5

¹NS- no shield; ²ES – external shield; ³IS – internal shield; ⁴Both – both internal and external shields

No other special logging investigation requests or other re-prioritization of boreholes for monitoring have been received or identified during this reporting period.

Operational Issues

During the 4th quarter of FY 2001, it was determined an average of approximately 1.5 boreholes were monitored per working day. This rate incorporates all operational aspects of monitoring, including both scheduled and unscheduled down time for maintenance, operator support, security, etc. The rate of monitoring achieved during the 1st quarter of FY 2002 was about 1.0 borehole per day, and the rate during the 2nd quarter of FY 2002 was about 1.3 boreholes per day. The rate improved during the 3rd quarter of FY 2002 to 1.9 boreholes per day. The project goal is to achieve an average of 3 boreholes per day.

The increase in monitoring rate this quarter is due to a decrease in the total amount of down time. The project experienced approximately 1/3 less down time this quarter as compared to the previous two quarters. This decrease can primarily be attributed to less equipment problems and the relaxing of the security measures that were put in place after September 11, 2001. The

project did experience an increase in down time due to the lack of operator/HPT support and dome load issues. CHG is aware that these issues continue to affect the productivity of the monitoring project and are attempting to improve their support.

Tables 3a and 3b include summaries of production and operational issues, respectively, that affect monitoring production.

Table 3a. Summary of Monitoring Production

Quarter	Total Work Days	Total Days Down	Total Boreholes Monitored	Boreholes Monitored per Day
4 th of FY01	56	29.3	84	1.5
1 st of FY02	56	35.2	54	1.0
2 nd of FY02	55	34.1	74	1.3
3 rd of FY02	59	21.1	113	1.9
Cumulative Total	226	119.7	325	N/A
Average/Quarter	56.5	29.9	81.3	1.4

Table 3b. Summary of Operational Down Time

Quarter	Equipment/ Truck Problems (hrs)	No HPT/ Operator Support (hrs)	Security Measures (hrs)	No Charge Code or Administrative (hrs)	Moving Truck (hrs)	Weather (hrs)	Misc. (hrs)	Total Down Time (hrs)
4 th of FY01	64	130	20	27	20	3	0	264
1 st of FY02	107	84	51	44	14	13	4	317
2 nd of FY02	143	40	24	58	9	18	15	307
3 rd of FY02	30.5	62	0	36	27	8	26	189.5
Cumulative Total	344.5	316	95	165	70	42	45	1077.5
Average/Quarter	86.1	79.0	23.8	41.3	17.5	10.5	11.25	269.4

Future Monitoring Operations

Attachment 4 provides a summary by tank farm of prioritized boreholes available for monitoring through the end of the 4th quarter of FY 2002. This list includes all boreholes with a total score

in excess of 25 and a next monitoring date that is overdue or will become overdue within 90 days and likely contains more boreholes than can actually be monitored during the quarter. The high rate logging is not considered in this list but will be conducted concurrently with the RAS monitoring.

As of the 3rd quarter, the highest priority boreholes in all tank farms have been monitored at least once. The monitoring will begin to recycle through the farms, collecting additional data from boreholes of interest, those selected for special study, and a nominal number of boreholes that have lower priority but have not been logged for several years. Tank farms BY, U, T, BX, SX, and TY are anticipated to be visited during the 4th quarter of FY 2002.

References

MACTEC-ERS, 1999. Letter from James F. Bertsch to John M. Silko, Subject: "Contaminant Movement in C Tank Farm," 3100-T99-0584, MACTEC-ERS, Richland, Washington.

MACTEC-ERS, 2002. Letter from James F. Bertsch to Robert Yasek (DOE-ORP), Subject: "Letter Report of Anomaly in Borehole 52-03-06," 3100-T02-0617, MACTEC-ERS, Richland, Washington.

U.S. Department of Energy (DOE), 2001. *Hanford Tank Farms Vadose Zone Monitoring Project, Baseline Monitoring Plan*, MAC-HGLP 1.8.1, Revision 0, Grand Junction Office, Grand Junction, Colorado.

Attachment 1
Boreholes Monitored During Third Quarter FY 2002

Attachment 1. Boreholes Monitored During Third Quarter FY 2002

Borehole Number	Tank	Top	Bottom	Footage	Rerun Footage	Total Score	Next Log Date	HRLS	RAS Event A	RAS Event B	RAS Event C	RAS Event D	Comment
21-02-04	BX-102	0	230	0		94	06/22/03	06/27/02	09/04/01				No apparent change; HRLS 6/27/02
10-00-04	A-103	45	85	40		12	05/30/07		06/25/02				No apparent change
10-03-01	A-103	45	125	80		12	05/30/07		06/25/02				No apparent change
10-01-01	A-101	45	85	40		89	06/16/03		06/27/01	06/21/02			No apparent change
10-01-03	A-101	45	78	33	10	89	06/16/03		06/27/01	06/21/02			No apparent change
10-01-04	A-101	35	85	50		114	06/16/03		06/27/01	06/21/02			No apparent change
10-05-05	A-105	45	74	29		115	06/15/03		06/25/01	06/20/02			No apparent change
10-05-07	A-105	45	75	30		115	06/15/03		06/26/01	06/20/02			No apparent change
10-05-08	A-105	45	55	10		115	06/15/03		06/26/01	06/20/02			No apparent change
10-05-10	A-105	25	100	75		140	06/15/03		06/26/01	06/20/02			No apparent change
10-05-12	A-105	45	75	30		115	06/15/03		06/26/01	06/20/02			No apparent change
10-01-28	A-101	20	43	23		114	06/13/03		06/19/01	06/18/02			No apparent change
10-01-39	A-101	20	44	24	10	114	06/13/03		06/20/01	06/18/02			No apparent change
10-00-06	A-103	45	85	40		12	05/23/07		06/18/02				No apparent change
10-05-02	A-105	45	119	74	10	115	06/13/03		06/25/01	06/18/02			No apparent change
10-01-16	A-101	20	52	32		114	06/12/03		06/19/01	06/17/02			No apparent change
11-01-02	AX-101	45	85	40		66	05/22/07		06/17/02				No apparent change
11-01-04	AX-101	45	85	40	10	66	05/22/07		06/17/02				No apparent change
11-01-01	AX-101	45	85	40		66	05/19/07		06/14/02				No apparent change
11-02-12	AX-102	20	50	30		30	06/09/03		06/14/02				No apparent change
11-03-02	AX-103	20	90	70		32	06/08/03		06/13/02				No apparent change
40-00-06	S-111	40	80	40		39	05/17/07		06/12/02				No apparent change
40-04-05	S-104	35	100	82		49	06/06/03	04/24/02	06/11/02				No apparent change
40-09-06	S-109	40	80	40	10	2	12/02/02		06/05/02				No apparent change; special request
40-11-09	S-111	40	80	40		39	05/10/07		06/05/02				No apparent change
40-12-02	S-112	40	80	40		12	12/02/02		06/05/02				No apparent change; special request
40-12-09	S-112	40	80	40		12	12/02/02		06/05/02				No apparent change; special request
40-12-04	S-112	40	80	40		12	12/01/02		06/04/02				No apparent change; special request
40-12-06	S-112	40	80	40		12	12/01/02		06/04/02				No apparent change; special request
40-12-07	S-112	40	80	40	10	12	12/01/02		06/04/02				No apparent change; special request
40-11-05	S-111	40	80	40	10	39	05/08/07		06/03/02				No apparent change
40-11-07	S-111	35	80	45		39	05/08/07		06/03/02				No apparent change
40-11-08	S-111	40	80	40		39	05/08/07		06/03/02				No apparent change
40-04-01	S-104	40	80	40		24	05/05/07		05/31/02				No apparent change
40-04-07	S-104	35	80	45		49	05/26/03		05/31/02				No apparent change
40-07-01	S-107	35	80	45		48	05/26/03		05/31/02				No apparent change
40-11-01	S-111	40	80	40		39	05/05/07		05/31/02				No apparent change
20-10-02	B-110	20	98	78		37	05/25/03		05/30/02				No apparent change; possible Sr-90 at 75 ft
20-10-09	B-110	35	75	40	10	12	05/04/07		05/30/02				No apparent change
20-00-05	B-101	35	110	75		39	05/24/03		05/29/02				No apparent change
20-01-06	B-101	25	60	35	10	39	05/24/03		05/29/02				No apparent change
20-10-07	B-110	35	75	40		37	05/24/03		05/29/02				No apparent change
20-01-01	B-101	35	75	40		39	05/23/03		05/28/02				No apparent change
20-06-03	B-106	35	75	40		33	05/23/03		05/28/02				No apparent change
20-07-05	B-107	35	80	45		26	04/27/07		05/23/02				No apparent change

Attachment 1. Boreholes Monitored During Third Quarter FY 2002

Borehole Number	Tank	Top	Bottom	Footage	Rerun Footage	Total Score	Next Log Date	HRLS	RAS Event A	RAS Event B	RAS Event C	RAS Event D	Comment
20-07-08	B-107	35	80	45	10	13	04/27/07		05/23/02				No apparent change
20-07-11	B-107	35	85	50		38	05/18/03		05/23/02				No apparent change; possible Sr-90 at 72 ft
20-07-02	B-107	35	100	70		38	05/17/03		05/22/02				No apparent change
21-10-03	BX-110	0	100	0		41	05/16/03	05/21/02	08/30/01				No apparent change; HRLS 05/21/02
52-03-06	TY-103	40	100	120	10	55	08/19/02		05/02/02	05/21/02			Definite change 55-60 ft; report issued 5/14/02
21-07-06	BX-107	20	102	0		36	05/15/03	05/20/02	09/05/01				No apparent change; HRLS 05/20/02
51-03-11	TX-103	40	100	60	10	30	11/16/02		05/20/02				Possible change 61-62 and 90-95 ft; freq. to 6 mos.
51-07-07	TX-107	40	85	55		29	05/15/03		05/20/02				No apparent change
51-04-02	TX-104	40	80	40		42	05/12/03		05/17/02				No apparent change
51-05-05	TX-105	40	80	40		64	11/13/02		05/17/02				No apparent change
51-05-07	TX-105	40	80	40	10	64	11/13/02		05/17/02				No apparent change
51-04-05	TX-104	40	98	58		54	11/12/02		05/16/02				No apparent change
51-04-06	TX-104	40	80	40	10	42	05/11/03		05/16/02				No apparent change
51-07-18	TX-107	40	80	40		29	05/11/03		05/16/02				No apparent change
51-05-01	TX-105	40	80	40		39	05/10/03		05/15/02				No apparent change
51-05-08	TX-105	40	80	40		33	04/19/07		05/15/02				No apparent change
51-05-10	TX-105	40	80	40		14	04/19/07		05/15/02				No apparent change
51-07-09	TX-107	40	100	60	10	23	04/19/07		05/15/02				No apparent change
51-03-12	TX-103	40	100	60		30	05/09/03		05/14/02				No apparent change
52-03-03	TY-103	40	80	61		30	05/09/03	05/13/02	05/14/02				No apparent change; HRLS 05/13/02
51-01-02	TX-101	40	80	40	10	41	05/08/03		05/13/02				No apparent change
51-03-01	TX-103	40	80	40		30	05/08/03		05/13/02				No apparent change
51-03-09	TX-103	40	98	58		55	11/09/02		05/13/02				No apparent change
51-05-03	TX-105	25	80	55		51	05/08/03		05/13/02				No apparent change
51-10-01	TX-110	35	95	60		21	04/13/07		05/09/02				No apparent change
51-10-13	TX-110	25	97	72		21	04/13/07		05/09/02				No apparent change
51-10-25	TX-110	40	98	58	10	21	04/13/07		05/09/02				No apparent change
51-15-04	TX-115	20	80	60		23	04/13/07		05/09/02				No apparent change
52-06-05	TY-106	40	148	108		67	11/04/02		05/08/02				Possible change 130-148 ft
52-06-02	TY-106	40	65	25		17	04/11/07		05/07/02				No apparent change
52-06-04	TY-106	40	80	40	10	54	05/02/03		05/07/02				No apparent change
52-06-06	TY-106	40	100	60		54	05/02/03		05/07/02				No apparent change
52-06-07	TY-106	200	238	38		42	05/02/03		05/07/02				No apparent change; Co-60 may be in GW
52-03-12	TY-103	40	100	60		30	04/27/03		05/02/02				No apparent change
52-05-07	TY-105	40	96	56		82	10/29/02		05/02/02				No apparent change
30-01-09	C-101	20	70	55	10	43	04/20/03		04/25/02				No apparent change
30-05-07	C-105	30	48	11		31	04/20/03		04/25/02				No apparent change; requires HRLS
40-02-03	S-102	20	80	0		39	04/20/03	04/25/02					HRLS 04/25/02; no apparent change
30-00-01	C-106	30	67	37		38	04/19/03		04/24/02				No apparent change
30-06-12	C-106	10	100	90		50	04/19/03		04/24/02				No apparent change
30-06-10	C-106	30	129	99		63	10/20/02		04/23/02				Possible change 124-126 ft Co-60
30-09-06	C-109	30	98	68	15	42	04/18/03		04/23/02				No apparent change
41-12-02	SX-112	40	122	0		63	04/18/03	04/23/02	10/03/01				No apparent change; HRLS 04/23/02
30-05-02	C-105	30	90	60		31	04/17/03		04/22/02				No apparent change
30-05-04	C-105	30	118	88	10	31	04/17/03		04/22/02				No apparent change

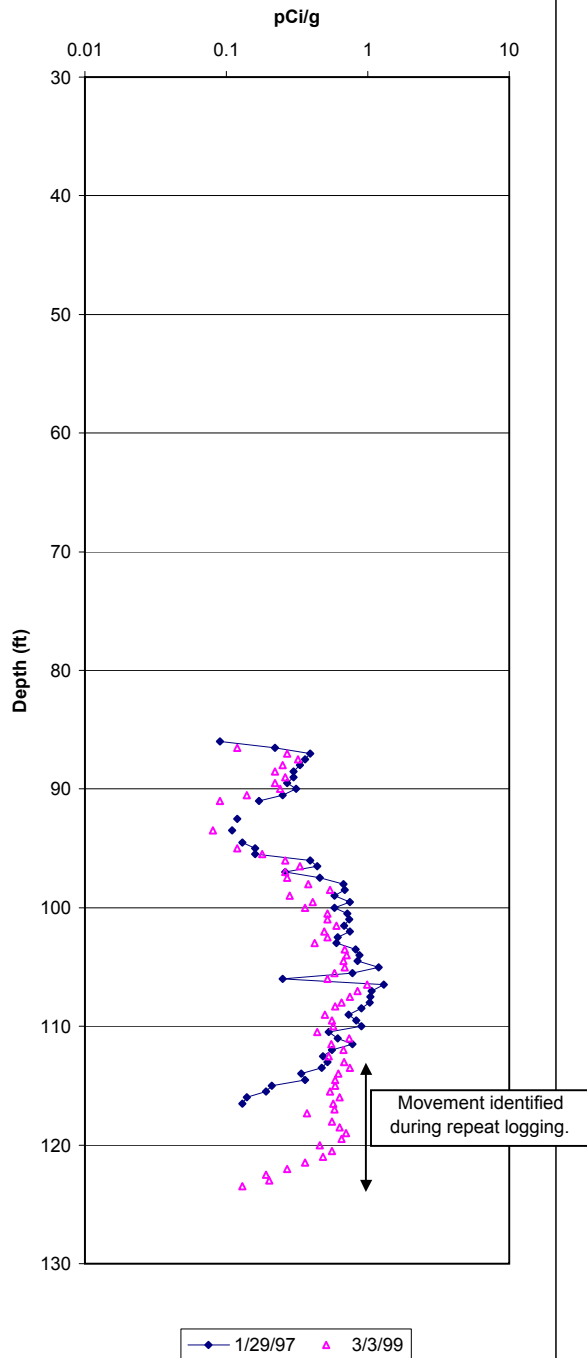
Attachment 1. Boreholes Monitored During Third Quarter FY 2002

Borehole Number	Tank	Top	Bottom	Footage	Rerun Footage	Total Score	Next Log Date	HRLS	RAS Event A	RAS Event B	RAS Event C	RAS Event D	Comment
30-05-08	C-105	30	49	19	14	31	04/17/03		04/22/02				No apparent change
30-06-09	C-106	25	80	55	10	50	04/17/03		04/22/02				No apparent change
41-09-03	SX-109	40	74	0		46	04/17/03	04/22/02	09/26/01				No apparent change; HRLS 04/22/02
41-09-07	SX-109	40	73	35		58	10/19/02	04/22/02	10/03/01	04/05/02			No apparent change; HRLS 04/22/02
30-03-09	C-103	30	98	68	15	54	04/14/03		04/19/02				No apparent change
30-05-03	C-105	30	90	60		31	04/14/03		04/19/02				No apparent change
41-07-05	SX-107	40	75	0		42	04/14/03	04/19/02	09/25/01				No apparent change; HRLS 04/19/02
41-07-07	SX-107	40	75	26		54	10/16/02	04/19/02	09/26/01	04/09/02			No apparent change; HRLS 04/19/02
30-01-01	C-101	30	70	40		31	03/23/07		04/18/02				No apparent change
30-01-06	C-101	30	70	40		43	04/13/03		04/18/02				No apparent change
30-00-03	C-102	30	70	40		37	03/23/07		04/18/02				No apparent change
41-08-07	SX-108	40	65	0		52	04/13/03	04/18/02	09/25/01				No apparent change; HRLS 04/18/02
41-08-11	SX-108	40	75	0		40	04/13/03	04/18/02	09/26/01				No apparent change; HRLS 04/18/02
41-11-10	SX-111	40	95	69		53	10/15/02	04/18/02	09/25/01	04/09/02			No apparent change; HRLS 04/18/02
30-05-05	C-105	30	98	68		31	04/12/03		04/17/02				No apparent change
60-07-02	U-107	35	100	65		53	07/14/02		07/12/01	10/04/01	12/26/01	04/15/02	Apparent decrease 90-100 ft not confirmed
60-07-10	U-107	40	99	59		85	07/14/02		07/09/01	10/24/01	12/27/01	04/15/02	Apparent change (SGLS); 53-65 ft not confirmed
60-07-11	U-107	40	100	60		85	07/14/02		07/12/01	10/24/01	12/27/01	04/15/02	Apparent change (SGLS); 73-95 ft not confirmed
60-08-04	U-108	35	100	65		56	07/14/02		07/09/01	10/25/01	12/28/01	04/15/02	No apparent change
60-10-01	U-110	35	75	40		11	07/10/02		07/17/01	10/04/01	12/27/01	04/11/02	No apparent change
60-10-11	U-110	35	75	40		11	07/10/02		07/17/01	10/04/01	01/02/02	04/11/02	No apparent change
60-04-08	U-104	40	105	65		94	07/09/02		07/16/01	10/22/01	01/03/02	04/10/02	Apparent change (74-78 and 84-89 ft) not confirmed
60-07-01	U-107	40	98	58		85	07/09/02		07/12/01	10/04/01	12/26/01	04/10/02	Apparent change 83-88 ft not confirmed
41-09-09	SX-109	40	95	66		58	10/02/02		10/03/01	04/05/02			No apparent change
41-14-06	SX-114	30	76	46		31	03/28/03		04/02/02				No apparent change
41-14-09	SX-114	40	75	35		31	03/28/03		04/02/02				No apparent change
41-14-11	SX-114	40	75	35	10	31	03/28/03		04/02/02				No apparent change
41-10-01	SX-110	40	80	40		54	09/28/02		09/13/01	04/01/02			No apparent change
41-12-04	SX-112	40	85	45	10	26	03/06/07		04/01/02				No apparent change
41-12-06	SX-112	40	73	33		26	03/06/07		04/01/02				No apparent change

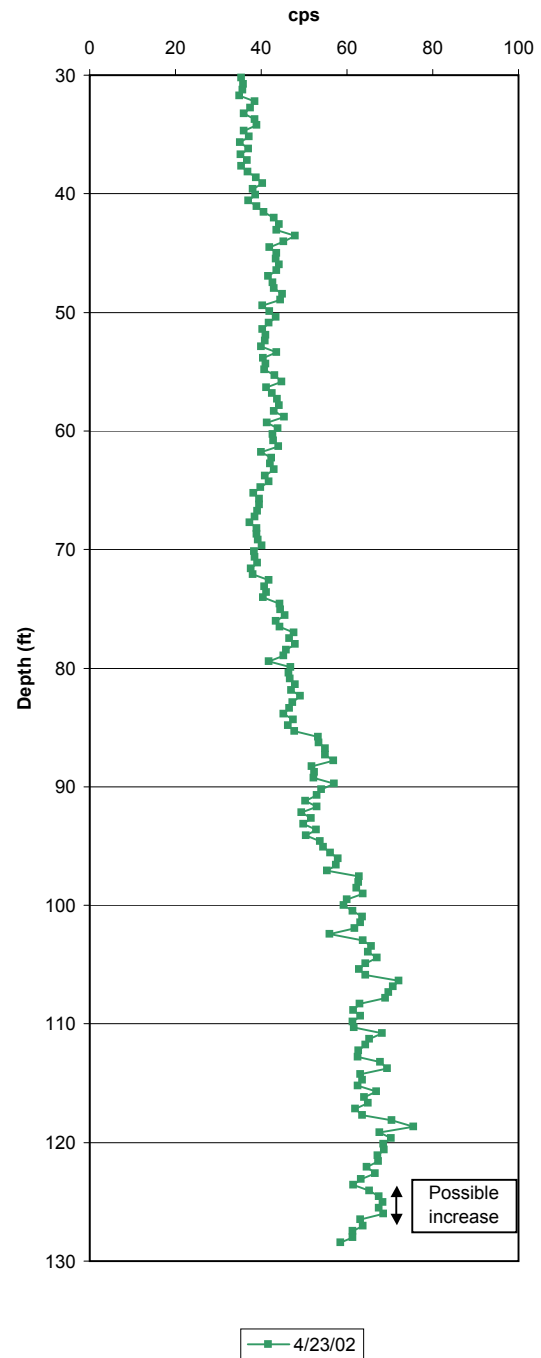
Attachment 2
Comparison of the Current RAS and
the SGLS Baseline Measurements

Borehole 30-06-10

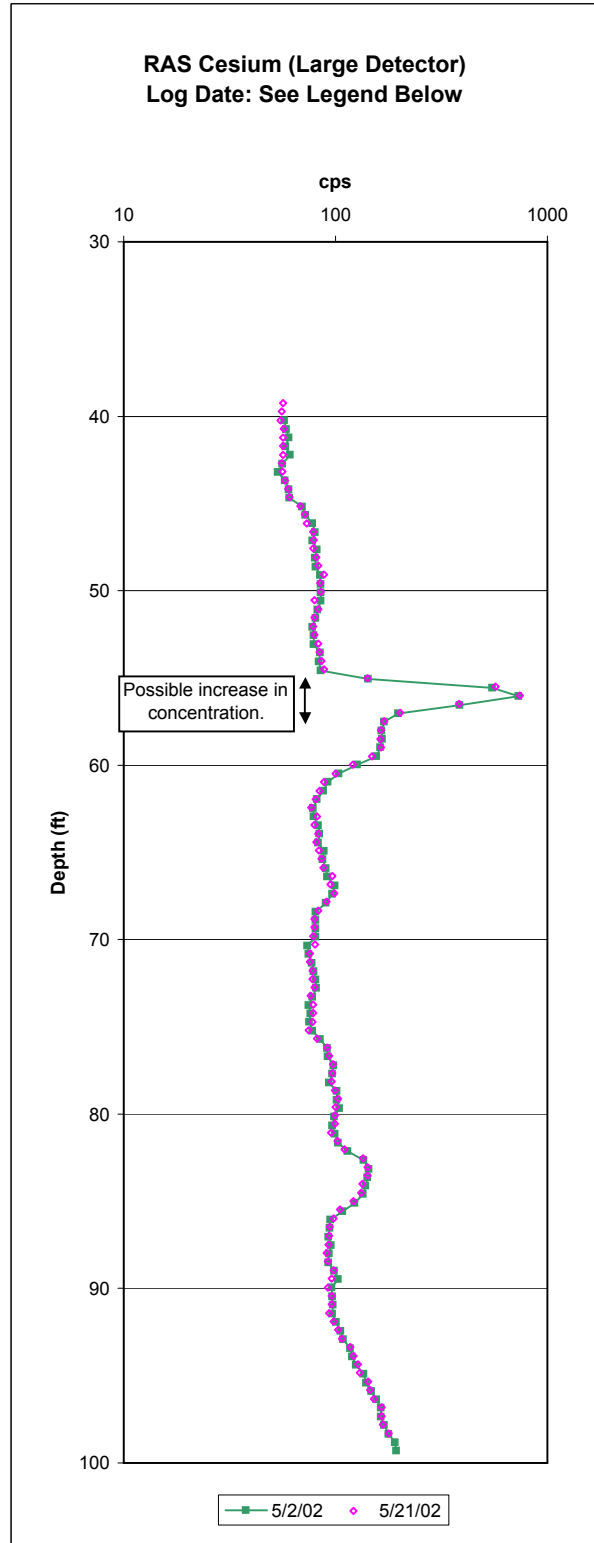
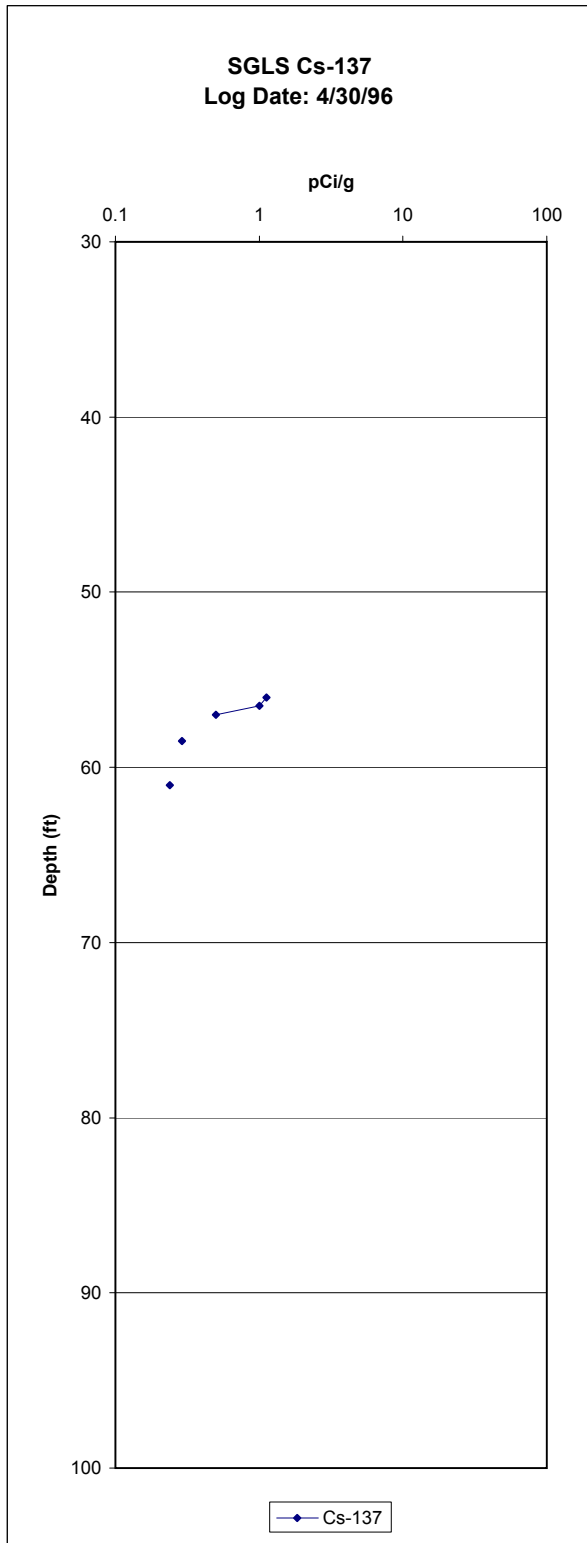
SGLS Co-60
Log Date: 1/29/97 & 3/3/99



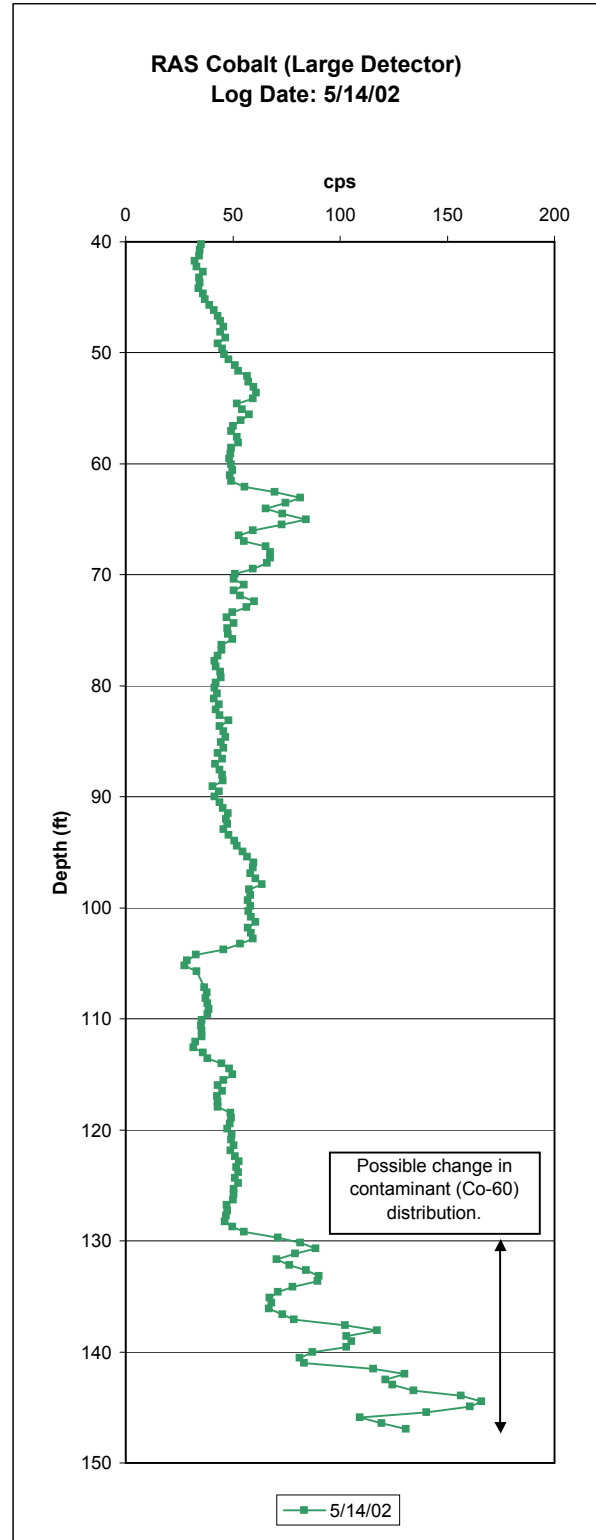
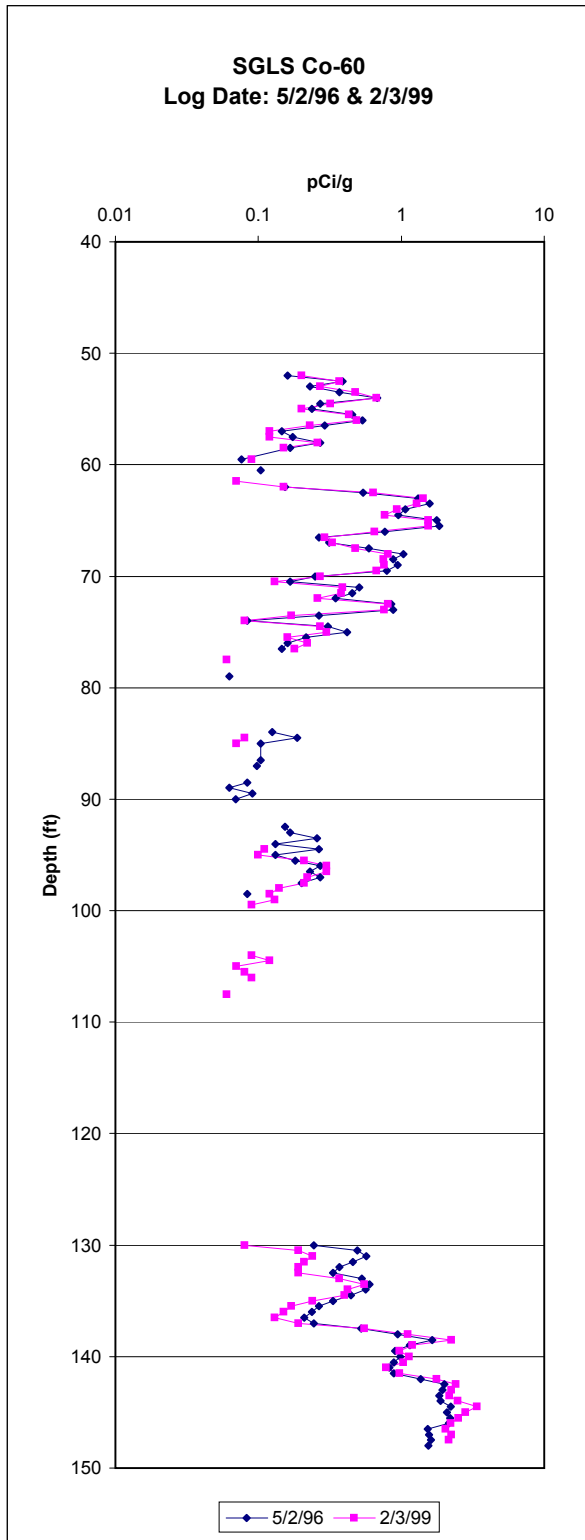
RAS Cobalt (Large Detector)
Log Date: 4/23/02



Borehole 52-03-06

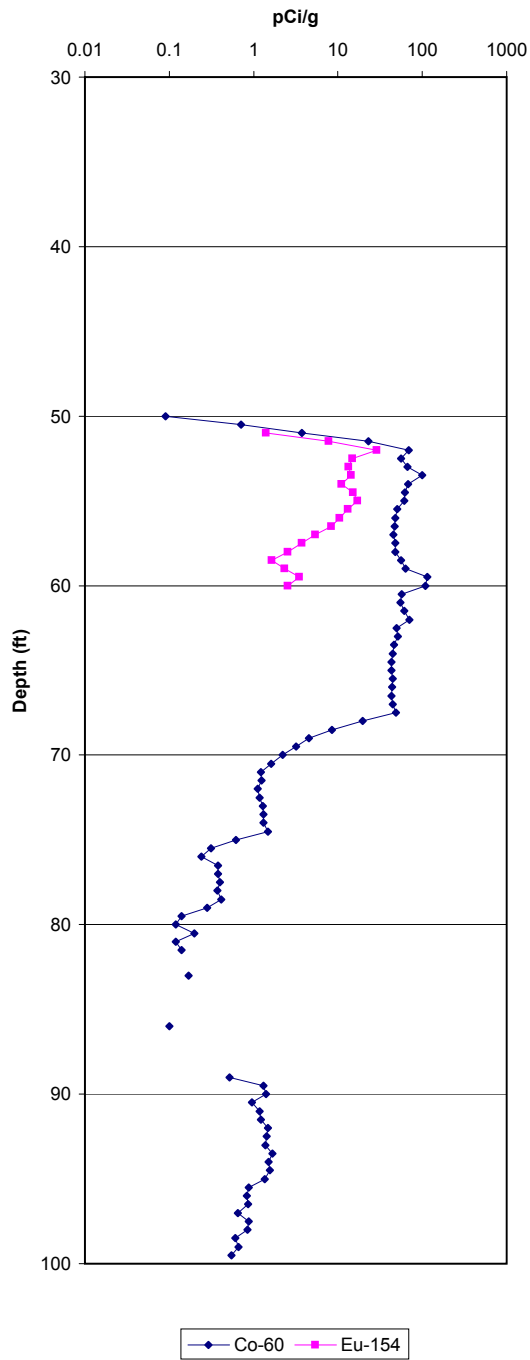


Borehole 52-06-05

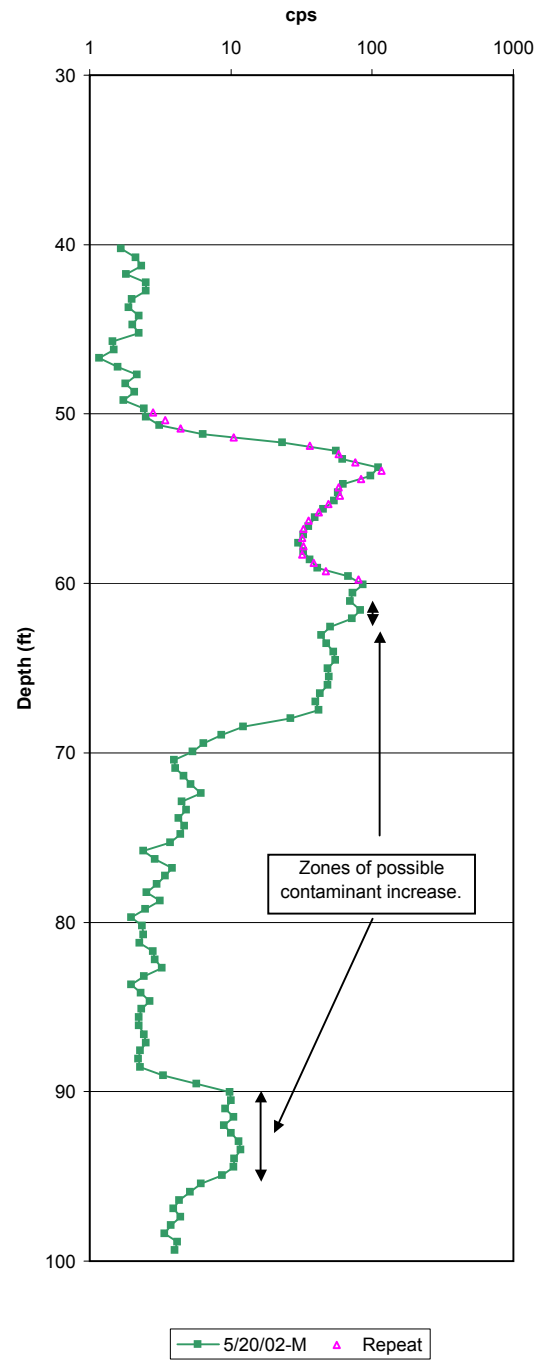


Borehole 51-03-11

SGLS Co-60 & Eu-154
Log Date: 12/21/95



RAS Cobalt (Medium Detector)
Log Date: 5/20/02



Attachment 3
Evidence of Potential Contaminant Movement
in Borehole 52-03-06

Evidence of Potential Contaminant Movement in Borehole 52-03-06

On May 2, 2002, RAS logging in TY Farm detected a significant increase in contaminant levels in borehole 52-03-06. The RAS log indicated a prominent peak at 55- to 57-ft depth that was not evident in the 1996 SGLS log. This contamination occurs approximately 10 to 11 ft below the base of the tank farm excavation. Preliminary evaluation of the RAS spectra indicated the contamination is ^{137}Cs .

Borehole 52-03-06 is located approximately equidistant between tanks TY-103 and TY-105. Information on these tanks was obtained from Hanlon (2002)¹ and from a query of the TWINS database. Both tanks are designated as leakers. Tank TY-103 was declared a leaker in 1973, and tank TY-105 was declared a leaker in 1960. Estimated leak volumes are 3,000 gallons for TY-103 and 35,000 gallons for TY-105. Both tanks were interim stabilized in February 1983. Both tanks have exhibited slow, steady declines in surface level during recent years.

Dave Barnes of CHG and Rob Yasek of DOE-ORP were informed of the anomaly on May 3, 2002. Occurrence Report PER2002-2444 was initiated by CHG to document the anomaly.

On May 9, 2002, borehole 52-03-06 was re-logged with the SGLS to confirm the anomaly detected with the RAS and to assess changes over the 6-year period since the previous log. Comparison of the 2002 and 1996 logs indicated that the ^{137}Cs concentration at 56-ft depth had increased from about 1 to 48 pCi/g. The comparison also indicated that ^{60}Co concentrations have decreased at a rate greater than can be accounted for by radioactive decay. Total gamma logs from the RAS and SGLS are shown in Figure 1.

The rapid decline in ^{60}Co concentration is interpreted to indicate that contaminant movement is continuing at the borehole location. Evaluation of historical gross gamma data between 1975 and 1995 focused on peaks between 55 to 65 ft (Figure 2) and 80 to 90 ft (Figure 3). In each case, an average count rate was computed for a 5-ft interval centered on the depth of maximum gamma activity. For the 55- to 65-ft interval (Figure 2), total gamma activity appears to be declining at a rate commensurate with decay of ^{60}Co from 1975 to 1985. From 1985 to 1994, however, the total activity appears to decrease at a greater rate. For the 80- to 90-ft interval (Figure 3), total activity increases rapidly from sometime shortly before 1975 to about mid-1978. From mid-1978 to 1981, total activity levels are elevated, but relatively stable. From 1981 to 1985, there is a gradual increase. In 1985, total activity levels begin to decrease. From 1985 to 1994, the rate of decrease is faster than can be explained by ^{60}Co decay. In the 1996 SGLS log, ^{60}Co is the only contaminant detected. The gross gamma data interpreted in context with the 1996 and 2002 SGLS data indicate that the primary contaminant in borehole 52-03-06 is ^{60}Co , and that there has been a net contaminant transport out of the region around the borehole since at least 1985. The historical data show that the contamination in the 55- to 65-ft interval was emplaced prior to 1975. In the 80- to 90-ft interval, the historical data suggest that the ^{60}Co was present shortly before 1975, and that levels continued to increase until 1985. From 1985 until the present, there has been a net depletion of ^{60}Co in the region around the borehole.

The ^{137}Cs contamination detected at 56 ft in the 2002 data is not evident in the historical gross gamma data. About 1 pCi/g of ^{137}Cs was detected at 56 ft in the 1996 SGLS log, suggesting that

the contamination may have reached borehole 52-03-06 at or shortly before 1996. The increase to about 48 pCi/g in 2002 indicates that a net influx of contamination has occurred over at least part of the 1996 to 2002 time period, and may be continuing.

The source of the abrupt increase in ^{137}Cs at 56 ft is not known. The location of the borehole is such that either tanks TY-103 or TY-105 could be the source of the activity. There are no data for the 6-year period from 1996 to 2002, and the onset of activity within that time frame is not known. There are no other boreholes in the immediate vicinity with which to confirm these findings, and the extent of the contamination plume is not known. Evaluation of the distribution and temporal behavior of the ^{60}Co and ^{137}Cs suggests that the two contaminants represent distinct contamination episodes that are probably unrelated. In other words, a relatively recent net increase in ^{137}Cs over a limited depth interval is superimposed on more extensive zone of ^{60}Co contamination that has been diminishing for some time. One potential source for the recent contamination in borehole 52-03-06 is a potential tank leak site on the eastern side of tank TY-103, where ^{137}Cs is detected between 43 and 52 ft in borehole 52-03-03. This contamination occurs at the base of the tank farm excavation and has been present since at least 1973. Results of high rate logging in 1999 indicated a relatively thin zone with ^{137}Cs concentrations on the order of 10,000,000 pCi/g at 47.5 ft. Results of high rate logging performed on May 13, 2002 indicate a similar profile, with no apparent difference in the ^{137}Cs concentrations. Tank TY-103 was declared to be leaking in 1973 on the basis of radiation readings in borehole 52-03-03, and a “slow, persistent leak” was noted even after the tank had been pumped to a minimum heel in July of 1973 (Luening 1973)².

Neutron moisture logging in borehole 52-03-06 and other boreholes is recommended to determine if the observed contaminant movement may be associated with increases in vadose zone moisture content. In addition, borehole 52-03-06 has been placed on a quarterly monitoring frequency.

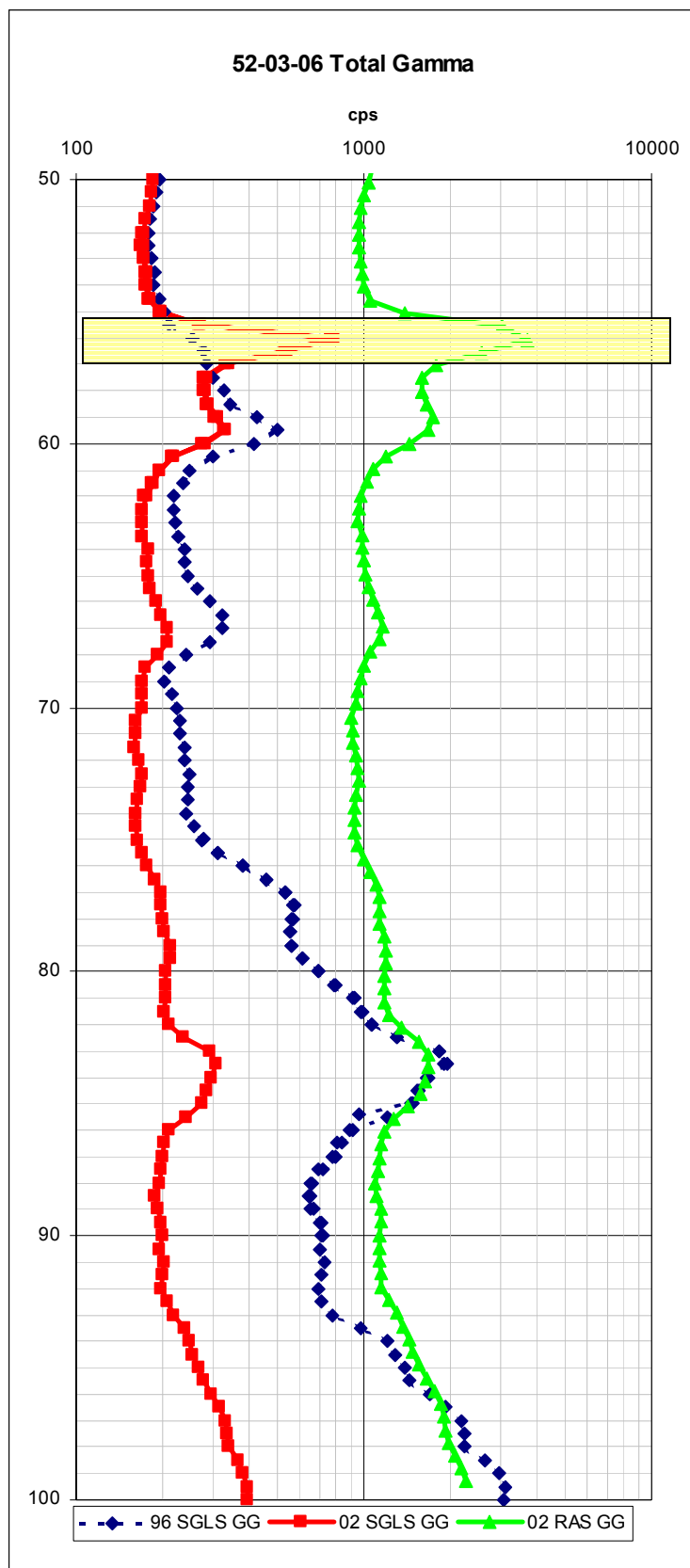


Figure 1

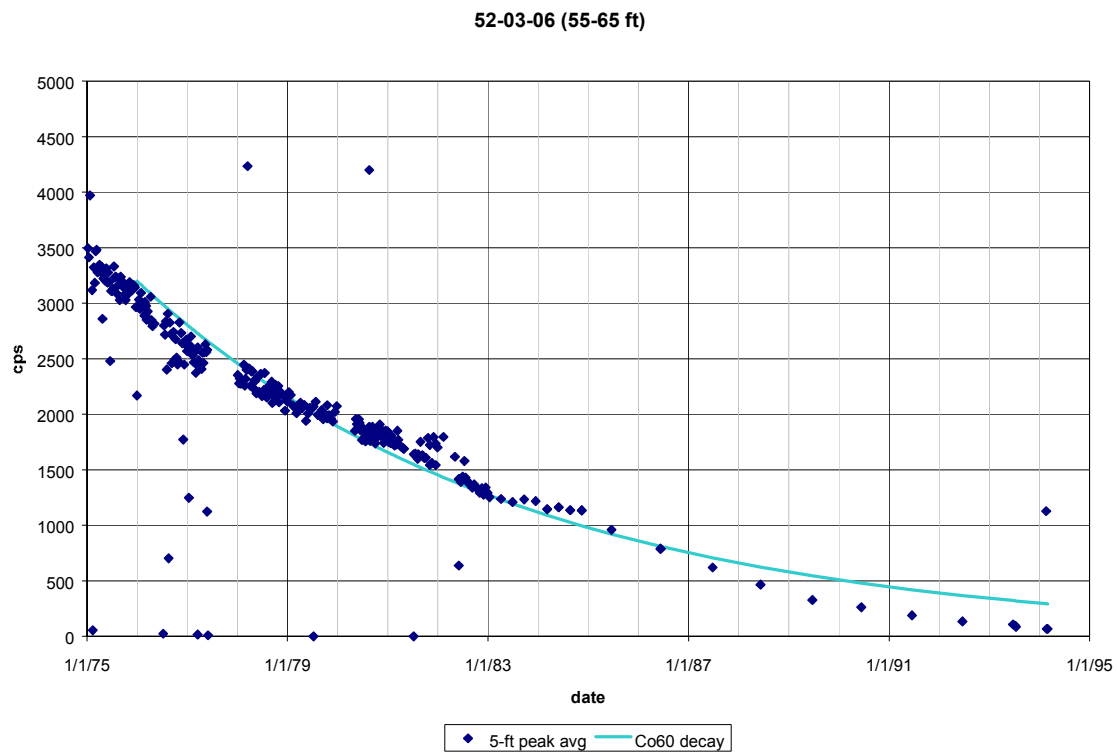


Figure 2

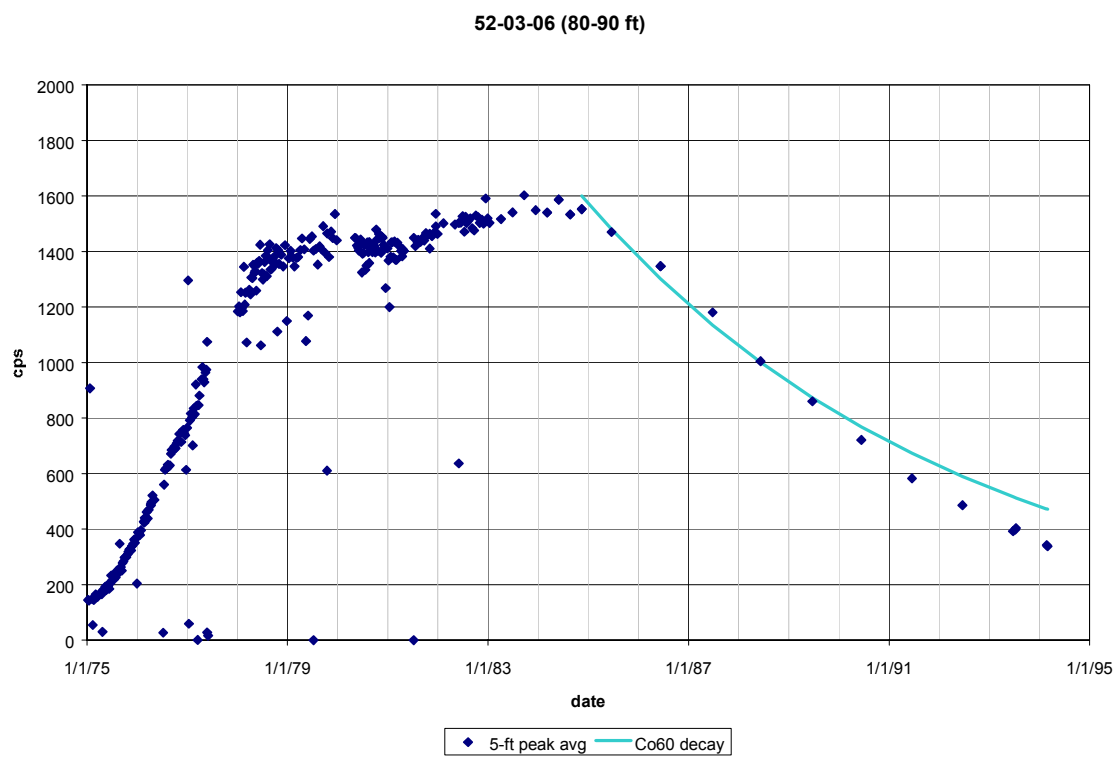


Figure 3

¹ Hanlon, B.M., 2002. *Waste Tank Summary Report for Month Ending May 31, 2002*, HNF-EP-0182, Rev. 170, CH2M Hill Hanford Group, Inc., Richland, WA, June, 2002.

² Luening, W.D., 1973. Letter to O.J. Elgert (U.S. Atomic Energy Commission), Subject: "Status of Tank TY-103," Atlantic Richfield Hanford Company, October 19, 1973.

Attachment 4
Boreholes Projected for Monitoring During
Fourth Quarter of FY 2002

Attachment 4. Boreholes Projected for Monitoring During Fourth Quarter of FY 2002

Borehole Number	Tank	Top	Bottom	Footage	Rerun Footage	Total Score	Next Log Date	HRLs	RAS Event A	RAS Event B	RAS Event C	RAS Event D	Comment
10-00-07	A-101	45	85	40		89	06/15/02		06/20/01				No apparent change
10-00-08	A-101	45	85	40		89	06/20/02		06/25/01				No apparent change
10-01-05	A-101	45	85	40		89	06/15/02		06/20/01				No apparent change
10-01-06	A-101	45	85	40		89	06/22/02		06/27/01				No apparent change
10-01-08	A-101	45	85	40		89	06/22/02		06/27/01				No apparent change
10-01-09	A-101	45	63	18		89	06/21/02		06/26/01				No apparent change
10-01-10	A-101	45	85	40		89	06/22/02		06/27/01				No apparent change
10-01-11	A-101	45	85	40		89	06/22/02		06/27/01				No apparent change
10-02-01	A-102	45	95	50		32	11/13/97						
10-02-03	A-102	45	125	80		32	10/27/97						
10-02-08	A-102	45	95	50		32	11/03/97						BE - Cs-137
10-03-07	A-103	45	125	80		37	10/20/97						
10-05-09	A-105	45	77	32		115	06/21/02		06/26/01				No apparent change
11-01-05	AX-101	45	85	40		66	07/27/01						
11-01-07	AX-101	45	85	40		66	07/26/01						BE - Cs-137
11-01-09	AX-101	45	85	40		66	07/31/01						BE - Cs-137
11-01-10	AX-101	45	73	28		66	08/01/01						BE - Cs-137
11-01-11	AX-101	45	85	40		66	08/02/01						BE - Cs-137
20-03-06	B-103	35	75	40		35	04/30/00						BE - Cs-137; hist. at 37 ft
20-02-09	B-105	35	100	65		34	09/11/98						BE - Cs-137
20-05-06	B-105	35	120	85		34	08/20/98						BE - Cs-137 - 55-120 ft
20-06-06	B-106	35	100	1		33	04/30/00						BE - Cs-137 - 58-100 ft
20-08-02	B-108	35	105	70		30	11/29/99						BE - Cs-137, hist. 58, 103 ft
20-08-07	B-108	35	80	45		30	10/24/99						Possible Sr-90 at 72 ft
20-09-06	B-109	35	100	65		31	09/14/98						
20-12-03	B-109	35	100	65		31	11/01/99						BE - Cs-137; hist. 60-90 ft
20-10-12	B-110	20	120	100		37	10/22/99						BE - Cs-137 - 108-120 ft; Sr-90
20-11-09	B-111	35	75	40		35	08/28/98						
20-12-06	B-111	35	75	40		35	10/29/99						Possible Sr-90 at 45 ft
21-00-02	BX-102	35	98	63		81	08/08/02		08/13/01				No apparent change
21-02-03	BX-102	35	99	64		106	09/09/02		08/14/01	03/13/02			No apparent change
21-02-06	BX-102	35	75	40		94	08/10/02		08/15/01				No apparent change
21-27-01	BX-102	35	99	64		106	09/09/02		08/28/01	03/13/02			No apparent change
21-27-02	BX-102	35	90	55		94	08/15/02		08/20/01				No apparent change
21-27-07	BX-102	35	139	104		94	08/10/02		08/15/01				No apparent change
21-27-08	BX-102	35	149	114		106	09/09/02		08/14/01	03/13/02			Apparent change 137.5-148.5 ft
21-27-09	BX-102	35	149	114		94	08/11/02		08/16/01				No apparent change
21-27-10	BX-102	30	149	119		94	08/08/02		08/13/01				No apparent change
21-27-11	BX-102	30	138	108		106	09/10/02		08/20/01	03/14/02			No apparent change
21-03-03	BX-103	35	90	55		54	08/24/02		08/28/01	02/25/02			No apparent change
21-04-08	BX-107	35	100	65		36	08/24/02		08/29/01				No apparent change
21-07-03	BX-107	35	100	65		36	08/24/02		08/29/01				No apparent change
21-08-12	BX-109	35	80	45		33	08/24/02		08/29/01				No apparent change
21-12-02	BX-109	35	75	40		33	08/24/02		08/29/01				No apparent change
21-10-01	BX-110	35	75	40		41	08/25/02		08/30/01				No apparent change
21-10-05	BX-110	30	70	40		41	09/01/02		09/06/01				No apparent change

Attachment 4. Boreholes Projected for Monitoring During Fourth Quarter of FY 2002

Borehole Number	Tank	Top	Bottom	Footage	Rerun Footage	Total Score	Next Log Date	HRLS	RAS Event A	RAS Event B	RAS Event C	RAS Event D	Comment
21-10-05	BX-110	65	98	33		41	09/01/02		09/06/01				No apparent change
22-01-04	BY-101	20	100	80		29	07/26/96						
22-01-07	BY-101	40	80	40		29	07/20/96						BE - Cs-137
22-00-04	BY-102	40	99	59		31	07/26/96						BE - Cs-137
22-02-01	BY-102	40	98	58		31	07/18/96						
22-02-07	BY-102	170	260	90		31	03/30/00						BE - Cs-137; Co-60, Cs-137 at GW
22-02-09	BY-102	20	80	60		31	03/23/00						TGA 40-50 ft; BE - Cs-137
22-00-02	BY-103	40	99	59		63	05/14/02		11/15/01				No apparent change
22-03-04	BY-103	40	101	61		63	05/14/02		11/15/01				Possible change 77-82 ft
22-04-07	BY-104	40	100	60		31	07/28/96						BE - Cs-137; Co-60 - 90-99 ft
22-04-09	BY-104	40	124	84		31	08/02/96						BE - Cs-137; Co-60 - 85-124 ft
22-06-05	BY-106	20	98	78		76	05/26/02		11/27/01				No apparent change
22-06-11	BY-106	40	80	40		26	07/20/00						BE - Cs-137
22-07-02	BY-107	30	100	70		68	05/28/02		11/29/01				Apparent change 98-100 ft
22-07-05	BY-107	30	97	67		68	06/10/02		12/12/01				Apparent change 75-81 ft
22-07-07	BY-107	40	99	59		68	06/10/02		12/12/01				No apparent change
22-08-02	BY-108	25	103	78		74	06/11/02		12/13/01				No apparent change
22-08-05	BY-108	35	98	63		74	06/15/02		12/17/01				Apparent change 75-82 ft
22-08-12	BY-108	30	90	60		74	06/11/02		12/13/01				No apparent change
22-09-01	BY-109	40	80	40		30	09/01/96						BE - Cs-137
22-09-07	BY-109	20	90	70		30	09/07/96						BE - Cs-137
22-09-08	BY-109	20	98	78		30	09/09/96						BE - Cs-137
22-09-11	BY-109	20	80	60		30	09/08/96						BE - Cs-137
22-10-07	BY-110	40	80	40		53	06/09/02		12/11/01				No apparent change
22-10-10	BY-110	40	98	58		28	09/03/96						BE - Cs-137
22-11-09	BY-111	25	80	55		27	09/09/96						BE - Cs-137
30-03-01	C-103	30	125	95		54	04/12/98						BE - Cs-137
30-03-03	C-103	30	98	68		54	04/06/98						Water in borehole; cannot log
30-03-05	C-103	30	70	40		29	03/19/02						BE - Cs-137
30-03-07	C-103	30	70	40		29	03/16/02						BE - Cs-137
30-05-10	C-105	10	70	60		31	01/10/98						BE - Cs-137
30-06-04	C-106	20	100	80		38	01/31/98						BE - Cs-137
30-08-02	C-108	30	90	60		27	03/13/98						BE - Cs-137; pipeline at 20 ft
30-09-01	C-109	30	99	69		30	03/22/98						BE - Cs-137
30-09-02	C-109	30	100	70		30	03/23/98						BE - Cs-137
30-09-07	C-109	30	95	65		30	03/15/98						BE - Cs-137
30-09-10	C-109	25	98	73		30	03/19/98						BE - Cs-137
30-09-11	C-109	30	70	40		30	03/20/98						
30-12-01	C-112	30	70	40		27	02/19/98						BE - Cs-137
30-12-13	C-112	25	70	45		27	02/20/98						BE - Cs-137
40-01-01	S-101	40	80	40		29	04/26/01						
40-01-04	S-101	40	80	40		29	04/27/01						BE - Cs-137
40-01-06	S-101	30	80	50		29	05/04/01						BE - Cs-137
40-01-08	S-101	40	80	40		29	05/05/01						
40-01-10	S-101	35	80	45		29	05/08/01						BE - Cs-137
40-02-07	S-102	20	80	60		39	05/24/97						

Attachment 4. Boreholes Projected for Monitoring During Fourth Quarter of FY 2002

Borehole Number	Tank	Top	Bottom	Footage	Rerun Footage	Total Score	Next Log Date	HRLS	RAS Event A	RAS Event B	RAS Event C	RAS Event D	Comment
40-02-08	S-102	20	80	60		39	09/21/00						
40-03-05	S-103	40	80	40		39	06/02/97						BE - Cs-137
40-04-08	S-104	20	50	30		49	05/19/97						Borehole obstruction
41-01-06	SX-101	25	80	55		39	09/01/02	09/06/01					No apparent change
41-01-10	SX-101	40	80	40		51	09/02/02	09/07/01					No apparent change
41-02-02	SX-102	25	140	115		82	09/22/02	09/07/01	03/26/02				Possible change; possible Sr-90
41-02-08	SX-102	40	80	40		70	09/05/02	09/10/01					No apparent change; possible Sr-90
41-02-11	SX-102	20	80	60		70	09/02/02	09/07/01					No apparent change
41-07-08	SX-107	40	76	46		54	03/16/02	09/17/01					Log with medium detector
41-08-02	SX-108	40	75	35		40	09/19/02	09/24/01					No apparent change
41-08-04	SX-108	35	76	41		52	09/12/02	09/17/01					No apparent change
41-00-08	SX-109	40	85	45		58	09/24/02	08/20/01	03/28/02				No apparent change
41-09-04	SX-109	40	102	62		58	03/08/00						Not logged due to borehole contamination
41-11-09	SX-111	40	75	35		41	09/12/02	09/17/01					No apparent change
41-12-07	SX-112	40	73	33		26	06/13/00						BE - Cs-137
41-12-09	SX-112	40	75	35		26	06/13/00						BE - Cs-137
41-15-07	SX-115	40	90	50		65	09/20/02	09/25/01					No apparent change
50-01-04	T-101	20	123	103		37	08/02/02	08/07/01					No apparent change; requires HRLS
50-01-06	T-101	30	87	57		50	07/25/02	07/30/01					No apparent change
50-01-09	T-101	30	90	60		62	07/21/02	07/30/01	11/08/01	01/22/02			Apparent change at 86-90 ft not confirmed
50-01-12	T-101	30	70	40		37	07/25/02	07/30/01					No apparent change
50-02-05	T-102	30	85	55		55	07/21/02	07/25/01	01/22/02				No apparent change
50-03-06	T-103	30	120	90		28	03/20/99						Water in borehole 01/02; not logged
50-04-08	T-104	30	96	66		55	07/23/02	07/31/01	01/24/02				No apparent change
50-04-10	T-104	35	88	53		55	07/21/02	07/31/01	01/22/02				Apparent change 67-68 ft
50-05-06	T-105	30	90	60		27	04/17/99						Water in borehole 01/02; not logged
50-05-11	T-105	30	120	90		39	07/20/02	07/25/01					No apparent change
50-00-09	T-106	30	120	90		143	07/08/02	07/18/01	01/09/02				No apparent change
50-00-10	T-106	30	70	40		93	07/13/02	07/18/01					No apparent change
50-06-02	T-106	30	122	92		143	07/14/02	07/19/01	11/07/01	01/15/02			Apparent change at 110 ft not confirmed
50-06-03	T-106	30	118	88		143	07/14/02	07/18/01	11/12/01	01/15/02			Apparent change at 115 ft not confirmed
50-06-04	T-106	30	60	30		118	07/27/02	08/01/01					No apparent change; requires HRLS
50-06-04	T-106	55	93	38		118	07/18/02	07/23/01					No apparent change
50-06-05	T-106	30	116	86		130	08/01/02	08/06/01					No apparent change; requires HRLS
50-06-06	T-106	30	70	40		130	07/27/02	08/01/01					No apparent change; requires HRLS
50-06-06	T-106	65	120	55		130	07/19/02	07/24/01					No apparent change
50-06-08	T-106	30	65	35		130	08/01/02	08/06/01					No apparent change; requires HRLS
50-06-08	T-106	46	120	74		130	07/20/02	07/25/01					No apparent change
50-06-11	T-106	30	83	53		118	07/14/02	07/19/01					No apparent change
50-06-16	T-106	30	50	20		130	07/27/02	08/01/01					No apparent change
50-06-16	T-106	45	86	41		130	07/19/02	07/24/01					No apparent change
50-06-17	T-106	30	87	57		118	08/02/02	08/07/01					No apparent change; requires HRLS
50-06-18	T-106	50	130	110		143	07/28/02	07/24/01	01/29/02				No apparent change
50-06-18	T-106	25	55	30		143	01/28/02	08/01/01					No apparent change
50-07-07	T-107	30	70	40		42	04/07/00						No log - water filled (06/18/01)
50-08-11	T-108	30	120	90		27	05/13/99						Water in borehole 01/02; not logged

Attachment 4. Boreholes Projected for Monitoring During Fourth Quarter of FY 2002

Borehole Number	Tank	Top	Bottom	Footage	Rerun Footage	Total Score	Next Log Date	HRLS	RAS Event A	RAS Event B	RAS Event C	RAS Event D	Comment
50-09-01	T-109	30	86	56		54	07/27/02		07/23/01	11/08/01	01/28/02		Apparent change at 85 ft not confirmed
50-09-02	T-109	30	86	56		54	07/07/02		01/08/02				Apparent change 81-86 ft
50-09-10	T-109	30	120	90		54	07/15/02		07/23/01	11/07/01	01/16/02		Apparent change at 76 and 94 ft not confirmed
51-01-06	TX-101	40	80	40		28	12/22/96						BE - Cs-137
51-01-08	TX-101	40	80	40		28	12/23/96						BE - Cs-137
51-01-09	TX-101	40	80	40		28	12/21/96						Borehole cannot be located
51-00-07	TX-104	40	105	65		29	02/10/97						BE - Cs-137
51-14-04	TX-114	40	97	57		34	02/01/97						
51-14-08	TX-114	40	85	45		34	02/06/97						
51-14-11	TX-114	40	100	60		34	11/30/00						
51-16-04	TX-116	35	80	45		38	01/02/97						
52-01-05	TY-101	35	80	45		26	04/27/97						
52-01-09	TY-101	40	99	59		26	04/28/97						
52-02-11	TY-102	35	80	45		29	05/05/97						
52-03-06	TY-103	40	100	120	10	55	08/19/02		05/02/02	05/21/02			Definite change 55-60 ft; report issued 5/14/02
60-04-08	U-104	40	105	65		94	07/09/02		07/16/01	10/22/01	01/03/02	04/10/02	Apparent change (74-78 and 84-89 ft) not confirmed
60-04-10	U-104	35	90	55		69	07/11/02		07/16/01				No apparent change
60-05-04	U-105	35	73	38		44	01/22/02		07/16/01	10/24/01			No apparent change
60-05-05	U-105	35	75	40		44	07/11/02		07/16/01				No apparent change
60-07-01	U-107	40	98	58		85	07/09/02		07/12/01	10/04/01	12/26/01	04/10/02	Apparent change 83-88 ft not confirmed
60-07-02	U-107	35	100	65		53	07/14/02		07/12/01	10/04/01	12/26/01	04/15/02	Apparent decrease 90-100 ft not confirmed
60-07-10	U-107	40	99	59		85	07/14/02		07/09/01	10/24/01	12/27/01	04/15/02	Apparent change (SGLS); 53-65 ft not confirmed
60-07-11	U-107	40	100	60		85	07/14/02		07/12/01	10/24/01	12/27/01	04/15/02	Apparent change (SGLS); 73-95 ft not confirmed
60-08-04	U-108	35	100	65		56	07/14/02		07/09/01	10/25/01	12/28/01	04/15/02	No apparent change
60-10-01	U-110	35	75	40		11	07/10/02		07/17/01	10/04/01	12/27/01	04/11/02	No apparent change
60-10-07	U-110	35	75	40		36	07/12/02		07/17/01				No apparent change
60-10-07	U-110	45	65	20		36	07/12/02		07/17/01				No apparent change; requires HRLS
60-10-11	U-110	35	75	40		11	07/10/02		07/17/01	10/04/01	01/02/02	04/11/02	No apparent change